the substrate and a counterelectrode, comprising:

depositing the catalytically active material on a metallic substrate, and

applying an electric direct voltage, on which an alternating voltage is superimposed in such a way that the sign of the sum voltage of direct and alternating voltage does not change, between the substrate and the counterelectrode.

A' cont

18. The process according to Claim 17, wherein the direct voltage at least corresponds to the deposition potential of the catalytically active material.

19. The process according to Claim 17, and further comprising providing the substrate, on its surface which is to be coated, with a predetermined surface roughness prior to the deposition.

20. The process according to Claim 19, wherein the surface roughness is in the range from 0.3 µm to 10 µm.

21. The process according to Claim 17, wherein the catalytically active material is deposited as substantially spherical metal clusters as a result of the alternating voltage component being applied with a frequency of over 50 Hz.

22. The process according to Claim 17, wherein the catalytically active material is deposited as substantially

dendritic metal clusters as a result of the alternating voltage component being applied with a frequency of between 5 and 50 Hz.

23. The process according to Claim 17, wherein the catalytically active material is a precious metal, a mixture of precious metals or catalytically active materials, or a mixture of precious metals and catalytically active materials.

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24. The process according to Claim 17, wherein said metallic substrate is a stainless steel substrate, and wherein substantially spherical platinum clusters are deposited on said stainless steel substrate from a solution of a platinum compound in 0.1 M H_2SO_4 with a platinum content of approximately 0.1 g/l as a result of a modulated voltage, comprising said direct voltage of approximately 1.3 volts superimposed with said alternating voltage with a voltage swing of 0.3-1 volt and a frequency of 50-100 Hz, being applied between said stainless steel substrate and said counterelectrode.

25. The process according to Claim 17, wherein said metallic substrate is a stainless steel substrate, and wherein substantially dendritic platinum clusters are deposited on said stainless steel substrate from a solution of a platinum compound in 0.1 M H_2SO_4 with a platinum content of approximately 0.1 g/l as a result of a modulated voltage, comprising said direct voltage of approximately 1.3 volts superimposed with said alternating voltage with a voltage swing of 0.3-1 volt and a

frequency of 5-15 Hz, being applied between said stainless steel substrate and said counterelectrode.

26. The process according to Claim 17, wherein said metallic substrate is a stainless steel substrate, and wherein substantially dendritic rhodium clusters are deposited on said stainless steel substrate from a solution of a rhodium compound in 0.1 M H_2SO_4 with a rhodium content of approximately 0.2 g/l as a result of a said direct voltage of 1.4-1.6 volt applied between said stainless steel substrate and said counterelectrode and said alternating voltage (V_{ac}) with a voltage swing (V_{PP}) of 0.3-1.5 volts and a frequency of 5-15 Hz being superimposed.

27. The process according to Claim 24, wherein the platinum clusters have sizes between 2 nm and 1 µm.

28. The process according to Claim 17, wherein the counterelectrode is formed by platinum-coated titanium.

29. The process according to Claim 25, wherein the platinum clusters have sizes between 2 nm and 1 µm.--